8th NOAA TBPG Workshop
Kansas City, MO
April 25-26, 2017

Roundup Presentation

Joint Center for Satellite Data Assimilation

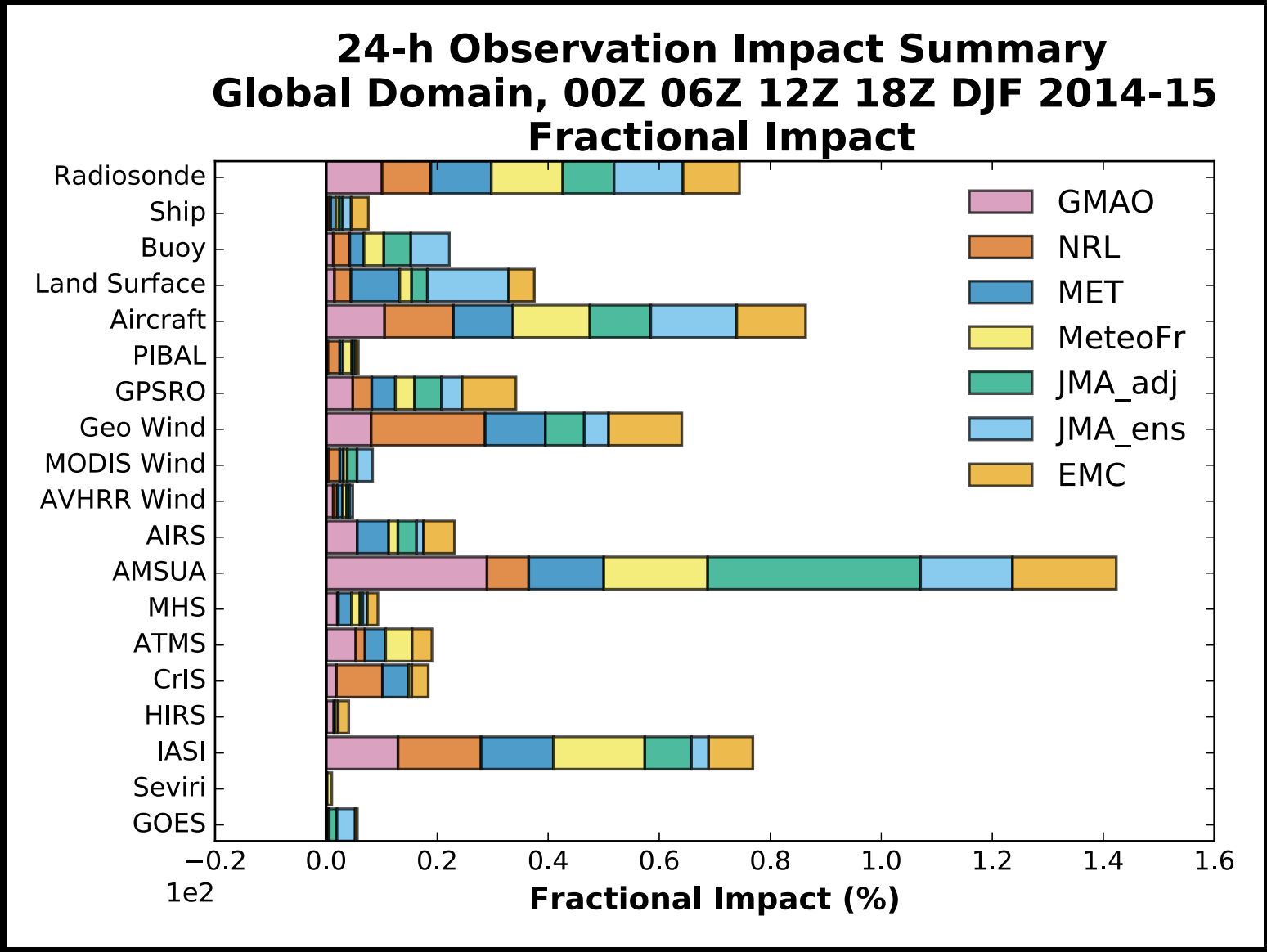
Presented by Jim Yoe

FY16 Highlights

Joint Center for Satellite Data Assimilation

- **JCSDA Observation System Assessment Standing Capability (JOSASC)**
  - Improved tools to diagnose impact of observations in operational NWP , such as inter-center FSOI inter-comparison
- **Improvements to Community Radiative Transfer Model (CRTM)**
- **Global Forecast Dropout Prediction Tool**
- **Improved Project Planning and Management Structure**

FSOI International Comparison



Community Radiative Transfer Model

CRTM Mission Satellite radiance simulation and assimilation for passive MW, IR, & Visible sensors of NOAA, NASA, DoD satellites, and others (200 sensors). Simulation of clear/cloudy/precipitating scenes

Highlights

- Generated CRTM coefficients for CubeSat MicroMAS2 and CIRAS; INSAT3DR IMGR and SNDR; JPSS1 VIIRS and GOES-S/T/U ABI; updated SSMI/S F16.
- Implemented CRTM-OSS alpha release for future unapodized radiance assimilation.
- Prepare CRTM Rel-2.3.0, including CrIS FSR, AIRS NLTE, MHS ACC coefficients, bug fixes, etc.

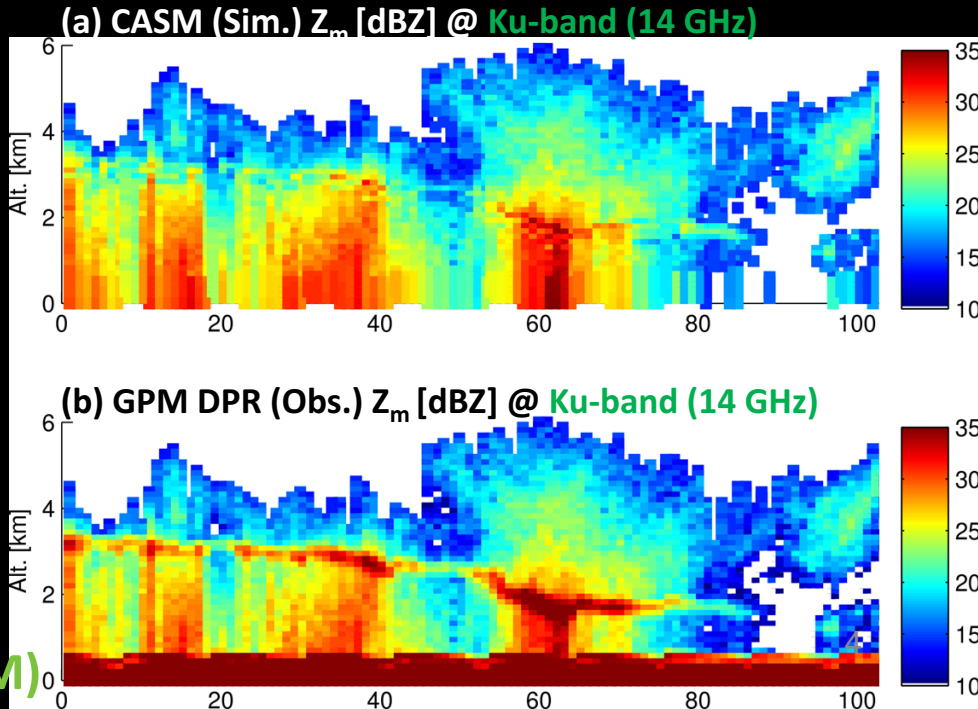
CRTM On-going/Future Development

- New sensors: CERES, EPIC-DISCOVR, JPSS-1
- Expand CRTM capability to CMAQ aerosols
- Implement CSEM surface emissivity model
- CRTM with cloud fraction capability

Community Line-By-Line Model (CLBLM)

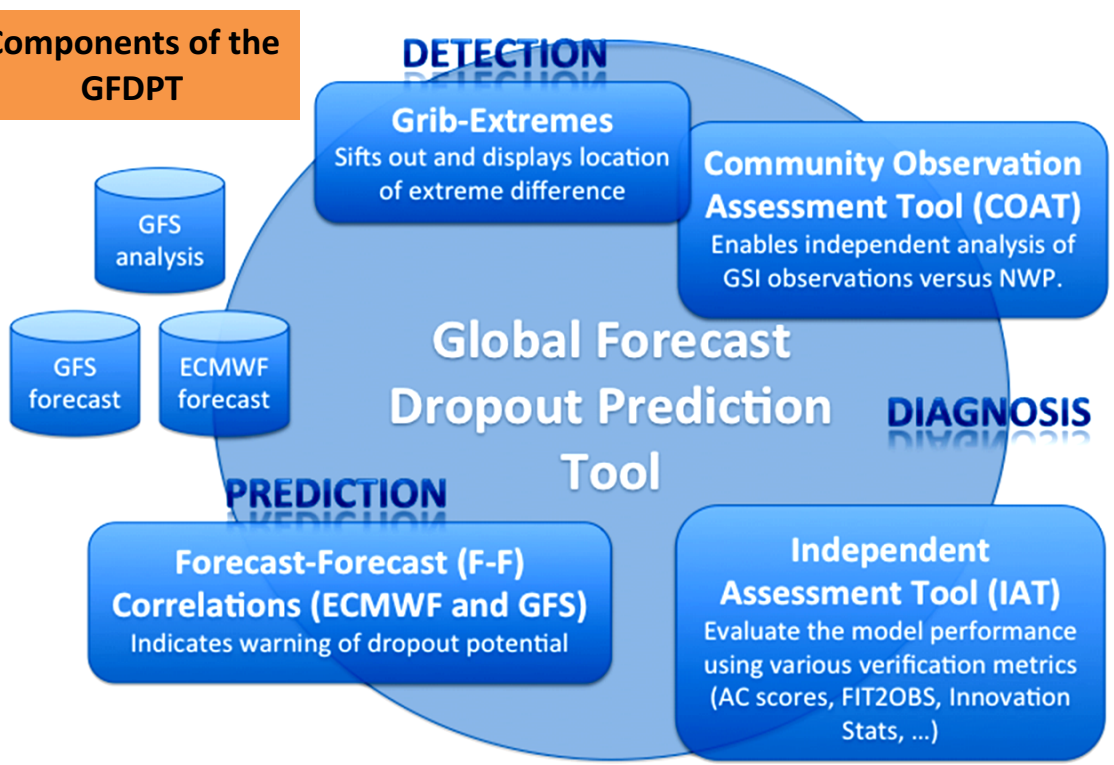
- Refactor the LBLRTM in modern Fortran
- Redesigned, simplified and enhanced LBL algorithm to facilitate future expanded sets of spectroscopic parameters

Community Active Sensor Module (CASM)



Global Forecast Dropout Prediction Tool

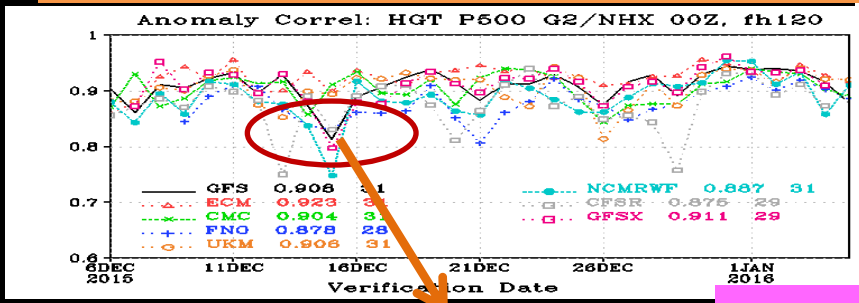
Components of the GFDPT

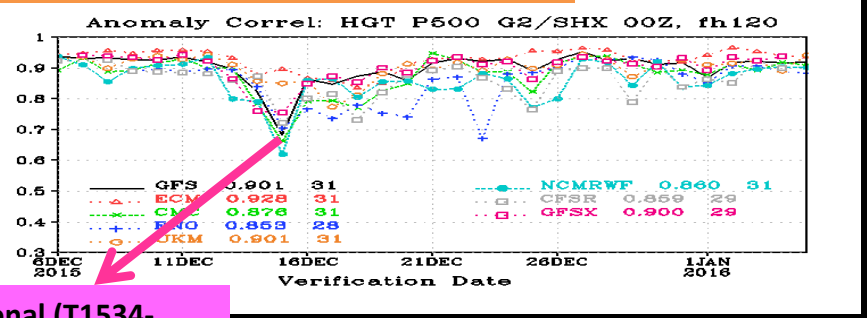


Multifaceted Capability

- *Develop a monitoring system to analyze differences between the NCEP and ECMWF global models operationally and provide diagnostic tools to the NCEP Model Evaluation Group (MEG) and Weather Prediction Center (WPC).*
- *Determine if the "dropouts" are from QC problems in the assimilation*
- *Evaluate dropout event(s) and automate diagnostics to determine if QC is responsible per particular Ob type both conventional and satellite Implement an improved QC system*

5-Day Northern and Southern Hemisphere Forecast Skill at 500 hPa from multiple NWP center models





EMCWF & UKMO did not dropout

GFS Operational (T1534-T574- 4D HYBRID-ENSVAR) SH dropout (20151215 00Z)

Top FY17 Highlights

Joint Center for Satellite Data Assimilation

- **Prototype Unified Forward Operator (UFO) for JEDI**
  - Capability to generate observation equivalent from multiple models and associated grids
- **Preparation/Testing/Demonstration for New Sensors**
  - JPSS Sounders, GOES-16 , GPSRO (CWDP, COSMIC 2, etc.)
- **Science/Technical improvements to CRTM**
  - Examples – All-sky radiance and radiances over land

Joint Effort for Data assimilation Integration (JEDI)

STRATEGY

1. Collective path toward Nation Unified Next-Generation Data Assimilation
2. Modular, Object-Oriented code for flexibility, robustness and optimization
3. Mutualize **model-agnostic** components across
   - Applications (atmosphere, ocean, land, aerosols, etc.)
   - Models & Grids (regional/global, FV3)
   - Observations (past, current and future)

OBJECTIVES

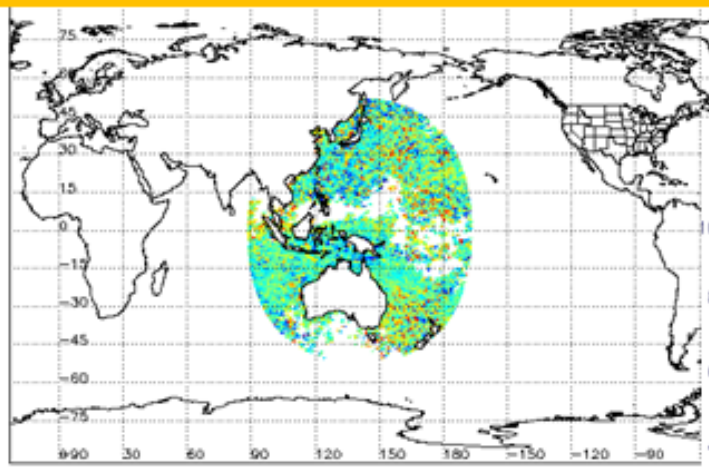
1. Facilitate **innovation** to address next scientific grand challenges
2. Increase **R2O** transition rate
3. Increase **science productivity** and code **performance**

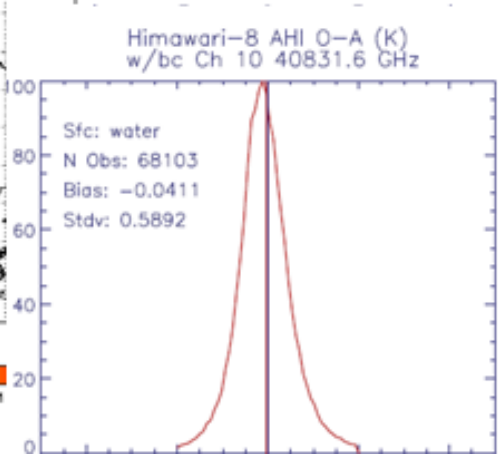
H8 AHI / GOES-16 ABI Assimilation

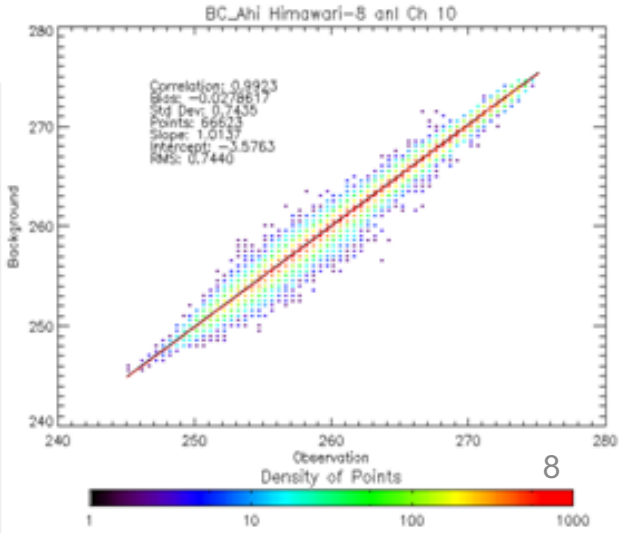
- Evaluate effectiveness of channel selection, spatio-temporal thinning, and super-obbing strategies for AHI L1B radiances. Extend to 4DEnVar. Perform forecast impact assessment (FSOI, OSEs)
- Preparing AHI radiance for RAP regional model ingestion
- Getting ready for GOES-R ABI initial assessment and assimilation

Significantly Improved bias after bias correction

Channel 10, O-A, bias corrected:

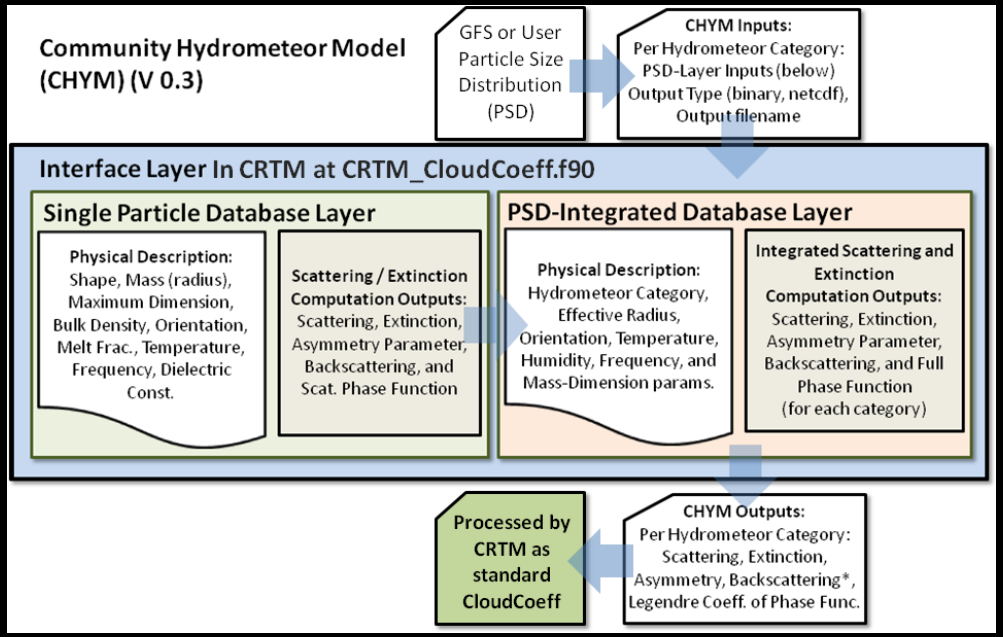


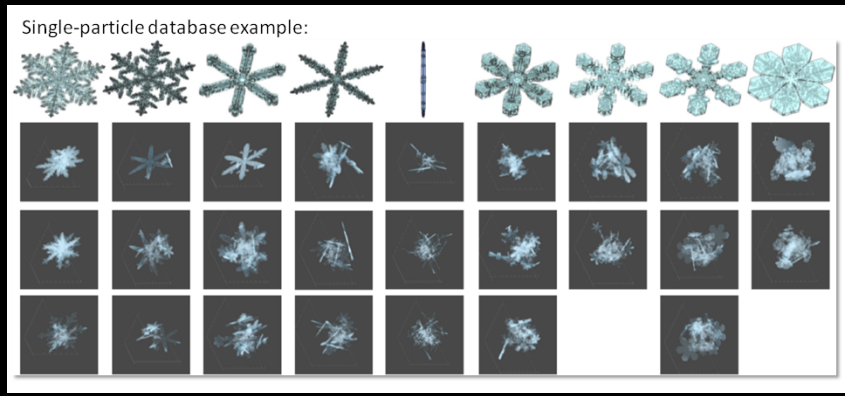




Assimilation of All-Sky Radiances

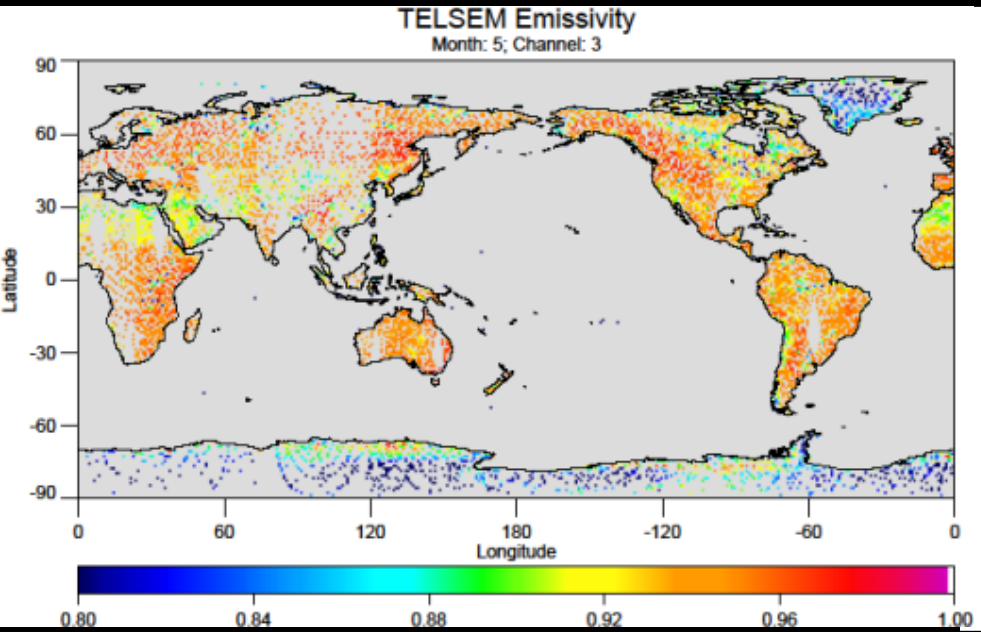
- MC6 "integrated database" delivered in March, 2016 from Texas A&M.
- Initial assessment of Community Hydrometeor Model (CHYM) shows potentially significant impact from modifying the cloud-coefficient file.
- Developed interface with CRTM and conduct long-run assimilation tests for sensitivity analysis, work with partners to coordinate GSI/GFS testing

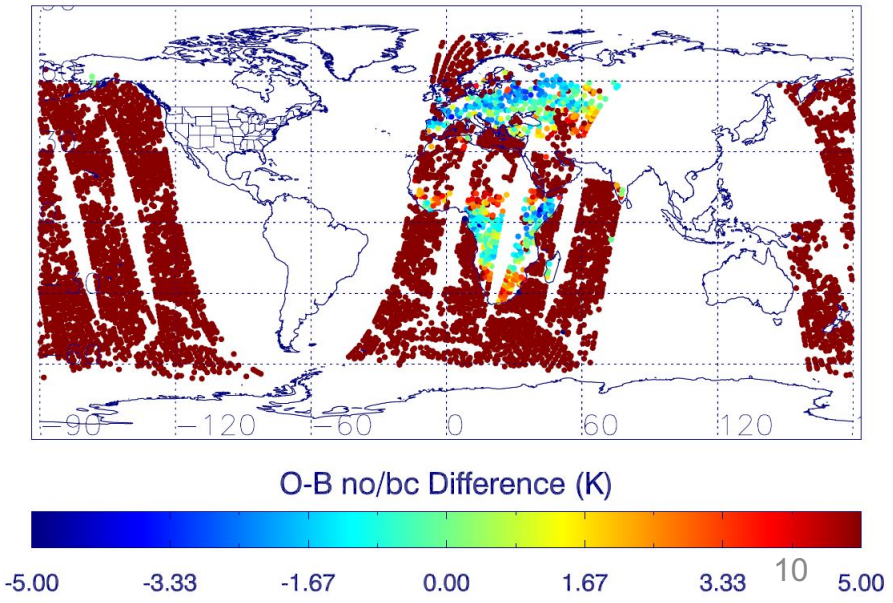




Satellite Radiances over Land

- Extend and improve efforts to assimilate satellite MW and IR radiance data over land and examine impact of emissivity first guess on analysis
- Implement emissivity as a control variable in GSI
- Perform Observation System Experiments to quantify the effectiveness of increased/improved assimilation of radiance data over land.
- Support the transition to operations of over-land MW and IR radiance assimilation and collaborate with researchers at JCSDA partner agencies to share methodologies and results.





Questions

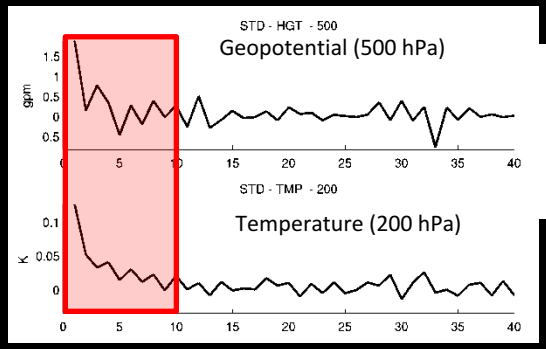
Joint Center for Satellite Data Assimilation

- **Points of Contact:**
- **james.g.yoe@noaa.gov ;**
- **thomas.auligne@noaa.gov**

- **Webpage:**
- **https://www.jcsda.noaa.gov/**

Joint Observing System Assessment Standing Capability (JOSASC)

- Methodology for impact studies on high-impact events
  - Remove spin-up period
  - Set up ensemble of DA experiments

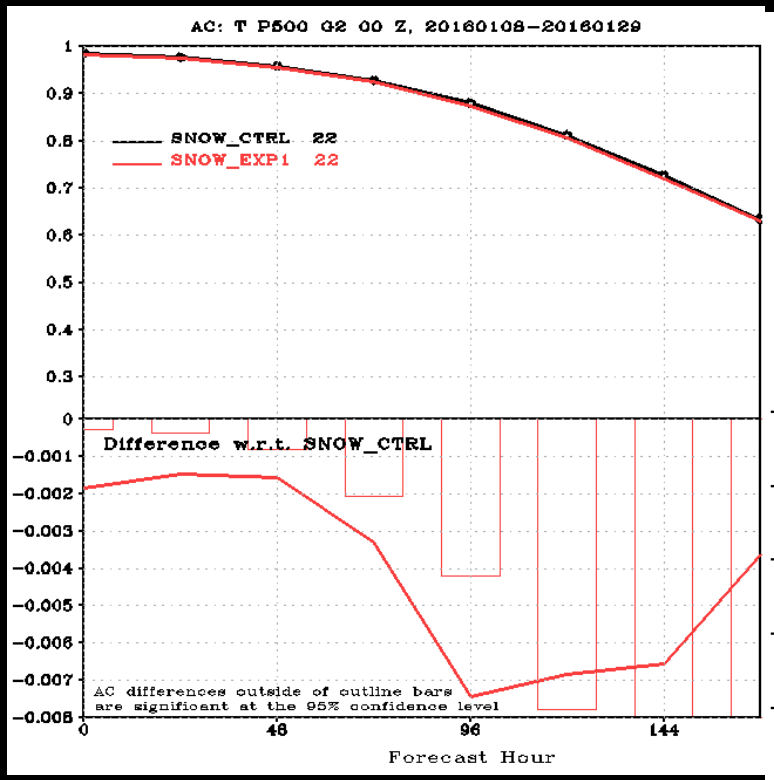


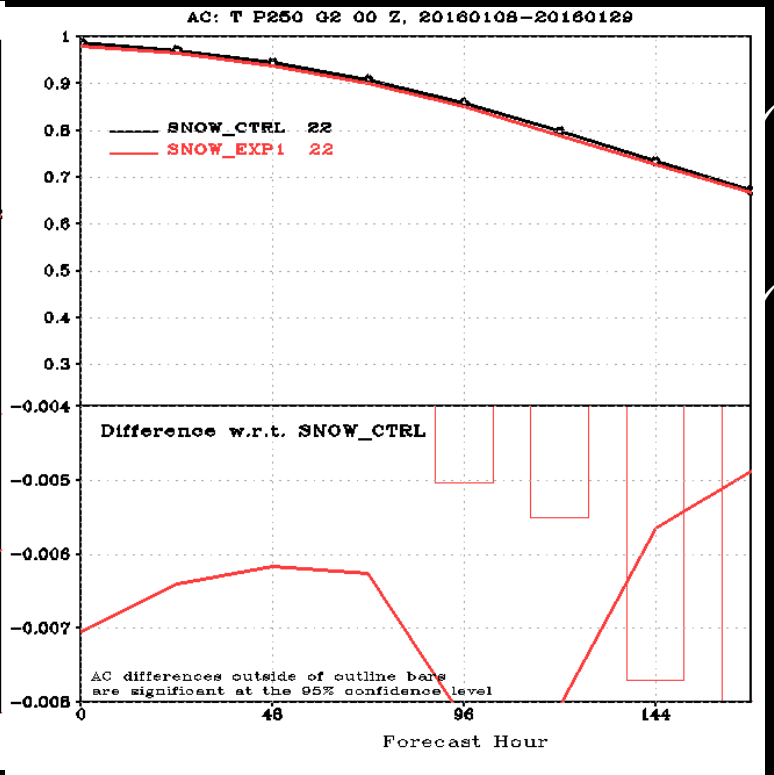
Stability test :

Stdev Asymptote *stdev(cy+1)-stdev(cy)*

CNTRL to 3POLAR – CNTRL

- **GPS-RO impact on GFS**





- GPSRO Denial lowers the Temp. A.C values over 500 & 250hPa.
- The difference is significant till 96 hrs at 500hPa and till 120 hrs at 250hpa pressure level.

Goal Alignment in 2017

- **New and Improved Observations**
  - Prepare for the assimilation of JPSS, GOES-16, COSMIC-2, evaluate Satellite Commercial data
  - Assimilation of radiances over land and sea-ice with improved estimation of surface emissivity
  - Improved use of all-sky radiances
- **CRTM (Community Radiative Transfer Model)**
  - Release 2.3.0 and CRTM Users Workshop
  - Acceleration via software optimization
  - Improved scattering tables for clouds and precipitation
- **Observation Impact Assessment**
  - Extend international FSOI intercomparison capability
  - Improved set of diagnostics (FSOI, OSEs, etc.) for evaluation of NWP forecast skill
  - Satellite commercial data evaluation (CWDP project)

Goal Alignment in 2017 (cont.)

- **Dropout**
  - Integration of web display of all the final products
  - Final Delivery of the Integrated GFDPT tool to the NCEP Operations
- **JEDI (Joint Effort for Data assimilation Integration)**
  - Unified Data Assimilation Planning Workshop
  - Prototype of Unified Forward Operator
  - Requirements and initial prototype of standardized observation access
- **Ocean, Sea-Ice, Coupled Data Assimilation**
  - Build Sea-ice DA components following JEDI standardized observation access
  - Initial integration into unified forward operator
- **Program Management**
  - Annual Operating Plan with Quarterly reports
  - Reinstate Science Advisory Committee
  - “Critical path” project planning to optimize operational transitions